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Ricke, Ellen; Bakker, Eric

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Case Report

## Measuring Adherence in Clinic-Based Physiotherapy; A Study of the Inter-Rater Reliability of A Dutch Measurement

Ellen Ricke\* and Eric Bakker<sup>1</sup>

<sup>1</sup>Department of Clinical Epidemiology, Biostatistics and Bioinformatics, Academic Medical Centre, Meibergdreef 9, 1105 AZ Amsterdam, the Netherlands

\*Corresponding author: Ellen Ricke, Faleriolaan 233, 2182 TM Hillegom, the Netherlands, Tel: +31621181702;

E-mail: ellenricke@outlook.com

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### Abstract

**Introduction:** The assessment of adherence forms an important part of positive treatment outcomes, and there is need to adapting them to the Dutch population.

**Objective:** To evaluate the inter-rater reliability of the Dutch version of the Rehabilitation Adherence Measure for Athletic Training (RAdMAT-NL) in patients who are undertaking physiotherapeutic rehabilitation in a primary physiotherapy practice.

**Design and procedure:** Two groups participated in a cross-sectional study conducted between 1 November and 1 December 2017. Two matched physiotherapists independently assessed the adherence of a patient at the end of a treatment using the Dutch version of the 16-item RAdMAT. The inter-rater reliability was evaluated using the intraclass correlation coefficient (ICC) (2,1). The ICC was calculated for all the participants together, after which it was calculated again for patients with musculoskeletal injuries and patients with chronic diseases separately.

**Participants:** 36 patients-18 with musculoskeletal injuries and 18 with chronic diseases (MS, COPD, dystrophy, Parkinson's disease and partial paraplegia).

**Results:** The inter-rater reliability of the RAdMAT-NL is excellent: ICC = 0.98 for all the participants. The inter-rater reliability is also excellent for patients with musculoskeletal injuries (ICC = 0.98) and patients with chronic diseases (ICC = 0.99).

**Conclusion:** The inter-rater reliability of the RAdMAT-NL is excellent in patients who are undertaking physiotherapeutic rehabilitation in a primary physiotherapy practice.

**Keywords:** Adherence; Physiotherapy; Measurement; RAdMAT

## Introduction

Non-adherence to treatment is a problem across therapeutic areas, also including physiotherapy, with non-adherence rates ranging from 25% to 50% [1, 2]. Poor adherence limits the potential of physiotherapeutic rehabilitation to improve patients' health and quality of life. Furthermore, this non-adherence has been associated with substantial costs (for patients and society), including avoidable morbidity, increased hospital admissions, and prolonged hospital stays [1, 2]. For example, non-adherent patients with type II diabetes can have annual inpatient costs 41% higher compared to adherent patients [3]. Significant costs can be avoided by increasing adherence [3]. So, non-adherence to physiotherapeutic rehabilitation is a problem of increasing concern to all stakeholders in the health system. At the same time, adherence is the most important factor of treatment that can be influenced to achieve positive treatment outcomes [1].

In this study adherence is defined as the extent to which a person's behavior-taking medication, following a diet, and/or executing lifestyle changes-corresponds with agreed recommendations from a health care provider [4]. In physiotherapy, adherence is a multi-dimensional concept that could relate to attending appointments, following advice, undertaking prescribed exercises and the performance and frequency of the exercises [5].

Physiotherapists almost always assume that patients are motivated to follow treatment because of their injury/illness. However, literature show that this assumption might be incorrect [6, 7]. The determinants of adherence in physiotherapy (inactive or moderate active lifestyle at baseline, low adherence to exercise, low self-efficacy, depression, anxiety, helplessness, poor social support, and greater number of perceived barriers to exercise) suggest that adherence is a behavioral problem observed in patients, but with causes beyond the patient [5, 7].

In every situation in which patients have to take responsibility of their own treatment, non-adherence is likely. This is especially true for patients with chronic diseases. Non-adherence increases with the duration and complexity of a treatment, both of which are high for chronic diseases [7]. Poor adherence to long-term therapy severely com-

promises the effectiveness of treatment. This is a critical health issue, because chronic diseases are increasing in The Netherlands. In the Netherlands (as in western society), the prevalence of chronic diseases is increasing due to the rapid aging of the population and the greater longevity of people with chronic conditions. Also, the prevalence of multi-morbidity (the presence of multiple diseases in the same individual) is rising [8]. Because of the increase of patients with chronic diseases, physiotherapists in the Netherlands have noticed an increase of these patients in their practice. This number will only further increase in the future [9].

So, physiotherapists will also benefit from more patients adhering more to their treatment. The environment, in which the physiotherapist works, is more demanding for evidence-based work with a focus on reduction of health-care costs. When patients adhere to evidence-based interventions, physiotherapists notice positive results and will not unnecessary change the intervention. This may result in more effective treatments and possibly a shorter treatment period. It will help physiotherapists work effectively, be more cost-efficient and contribute to the patient's self-reliance [6, 7].

To increase adherence, it must be first measured comprehensive. When an unexpected poor outcome is seen in patients, a reliable and valid measurement to assess adherence should be available. That way, the physiotherapist can assess the diverse range of adherence attitudes and behaviors in the patient. The physiotherapist can engage in dialogue with the patient about the non-adherence and can implement strategies to target the attitudes and behaviors of non-adherence. Ultimately this may lead to better treatment outcomes. Because adherence is a multi-dimensional concept, a measurement of adherence also has to be multi-dimensional (measure more domains at the same time) [7, 10].

There is currently no gold standard for measuring exercise adherence and a lot of measures have been identified in musculoskeletal disorders [11], but only one multi-dimensional instrument has been described to measure adherence in physiotherapy practice: The Rehabilitation Adherence Measure for Athletic Training [12, 13]. The

RAdMAT is considered to be reliable, valid, responsive and interpretable at an individual level, easy and simple to use, and low cost [14] in patients with musculoskeletal complaints who are visiting a primary physiotherapy practice.

### **Applicability of the RAdMAT in Dutch physiotherapy practices**

To date, the RAdMAT is available only in English. This original version shows promising psychometric properties. Internal consistency reliabilities ranges between 0.96 and 0.99 and Cronbach's alphas for each level of adherence are acceptable to high [12]. Because a measurement also has to be simple and easy to use [14] a Dutch version of the RAdMAT should be available.

For this study a Dutch version of the RAdMAT (RAdMAT-NL) was prepared by a native speaker based on the guidelines of translating questionnaires [15, 16]. This questionnaire, like the original version of the RAdMAT, is a 16-item questionnaire that uses a four-point Likert scale (1 = never, 2 = occasionally, 3 = often, 4 = always) [12]. Also, the conceptual meaning of the original measurement was maintained and the setting and the position of the raters were the same as used in the original version of the RAdMAT.

However, the RAdMAT-NL is a new measurement, so the reliability of the RAdMAT-NL is unknown. When a measurement is adjusted (translated) or is used for another population (have become a new measurement), it is important to reassess the validity and reliability of the measurement. Reliability is the consistency or repeatability of the measures [14]. There are two aspects of reliability. First the intra-rater reliability: the degree of agreement among repeated administrations of a diagnostic test performed by a single rater. Second is the inter-rater reliability: the degree of agreement among raters [14].

The RAdMAT-NL has to be reliable and valid to ensure that the evaluation is consistent and accurate [14]. If the RAdMAT-NL shows psychometric properties similar to or higher than the original measurement, it may be considered as culturally acceptable [16]. Evaluating the reliability of the RAdMAT-NL would be a first step in the development of a Dutch instrument for measuring adherence in the physiotherapy practice.

iotherapy practice.

Therefore, the purpose of this study was to measure the inter-rater reliability of the Dutch version of the RAdMAT (RAdMAT-NL) in patients who are undertaking physiotherapeutic rehabilitation (patients with musculoskeletal complaints and with chronic diseases).

### **Materials and Methods**

**Study design:** This was a cross sectional study conducted between 1 November and 1 December 2017.

**Setting:** A primary physiotherapy practice in the Netherlands was chosen because the original version of the RAdMAT is validated for use in a primary practice setting and because this practice has a diverse patient population, including patients with musculoskeletal complaints and with chronic diseases, like diabetes, chronic obstructive pulmonary disease (COPD) and multiple sclerosis (MS). The presence of patients with chronic diseases is important, because this study had to evaluate the use of the RAdMAT-NL in this population.

**Participants:** Participants were patients undertaking physiotherapeutic rehabilitation in the primary physiotherapy practice who met the inclusion and exclusion criteria. The inclusion criteria were: being at least 18 years old, undertaking rehabilitation at the practice (rather than at home), and having a musculoskeletal injury or a chronic disease. The exclusion criteria were rehabilitation at home, undertaking manual therapy or orofacial therapy, and insufficient mastery of the Dutch language.

**Routing:** Patients potentially meeting the inclusion criteria were asked to participate in this study by the researcher. The researcher provided the patients further information and checked if the patients met the inclusion criteria. Patients who met the criteria and agreed to participate signed an informed consent form and were included in the study, taking into account that half of the patients had musculoskeletal complaints and the other half had chronic diseases. Identifying and including patients continued till the sample size, needed for this study, was reached.

In the same period, participating physiotherapists

(raters) were invited to participate in this study and were told that the study used informed consent.

**Baseline variables:** Participants' age (year), gender (male/female), previous history of physiotherapy treatments (yes/no), and physiotherapeutic diagnosis (musculoskeletal injury or chronic disease) were recorded.

**Study procedure:** Before measurement, the researcher explained the meaning of adherence and the use of the RAdMAT-NL to the raters. The RAdMAT-NL is a 16-item questionnaire that uses a four-point Likert scale and asks about patient clinic-based adherence that includes the patients' attitudes and communication along with their clinic behaviors [13].

The raters were asked to assess the adherence of the patients independently. First the physiotherapists assessed adherence of three patients as a group. Based on this exercise, consensus was obtained regarding the use of this measurement.

Then two physiotherapists were randomly matched (based on their working days) to both assess the adherence of a patient when measurement started.

The following characteristics of the physiotherapist were recorded: gender (male/female), completed Master's degree (yes/no), and professional experience in a primary physiotherapy practice (years).

Between 1 November and 1 December 2017, the physiotherapists independently assessed the adherence of a patient at the end of the treatment. Participants were aware that they participated in the study and that they were assessed between 1 November and 1 December, but they did not know when the assessment took place. In this way, the participant was blinded for the assessment and could not meet with the rater (preventing information bias). Because both physiotherapists independently assessed the patients, their assessments were not influenced by each other—both raters were blinded for each other's results. During the study, it was assumed that the status of the patient remained unchanged and that the physiotherapists' method of assessment was standardized [14]. Comple-

ed questionnaires were returned to the researcher by the physiotherapists for processing.

**Sample size:** The sample size was calculated as follows. In general, reliability coefficients should be at least 0.9 to be interpretable at an individual patient level, while coefficients of at least 0.7 are acceptable at a group level [17]. So, the intended output of the intraclass correlation coefficient (ICC) was 0.9, with 0.7 as the acceptable lower limit. With two raters for one patient, a sample of 18.4 participants would be enough for a hypothetical ICC of 0.9 with acceptable lower limit of 0.7 (power = 0.80 en  $\alpha = 0.05$ ) [18]. Since differentiating between musculoskeletal injuries and other diseases was needed, 36 participants were needed.

**Data analysis:** Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 20 with an alpha level set at 0.05. Data were screened for outliers and tested for normal distribution. Descriptive statistics were used to evaluate the baseline variables of the patients (age, gender, previous history of physiotherapy treatments, and physiotherapeutic diagnosis) and the physiotherapists (gender, completed Master's degree, and years of professional experience in a primary physiotherapy practice). Variables were expressed in percentages or in the mean  $\pm$  standard deviation with a range.

The inter-rater reliability was evaluated using the intraclass correlation coefficient (2, 1): a two-way random effects single measures model with absolute agreement with a confidence interval of 95%. First, the ICC was calculated for all the participants, after which it was calculated for patients with musculoskeletal injuries and patients with chronic diseases separately. The ICC (2,1) describes the compliance between two repeated measures and future repeated measures of adherence [19]. The ICC was interpreted based on the guidelines described by Cicchetti [20]: less than 0.40 = poor; between 0.40 and 0.59 = fair; between 0.60 and 0.74 = good; between 0.75-1.00 = excellent.

## Results

Thirty-nine people were recruited: 17 males and 22 females. Three were asked to participate in training the

physiotherapists to reach consensus about the use of the RADMAT-NL and 36 participated in the study. Their demographic characteristics are shown in Table 1. Demographic characteristics of the six participating physiotherapists are shown in Table 2. Table 3 shows the mean scores of each rater per patient. The results show a high degree of congruence between the assessments. This is visually demonstrated in Figure 1, a plot of the measures of the raters. As shown in Table 4, the ICC score for all the participants and for participants with musculoskeletal injuries and chronic diseases were excellent.

**Table 1:** Demographic characteristics participant.

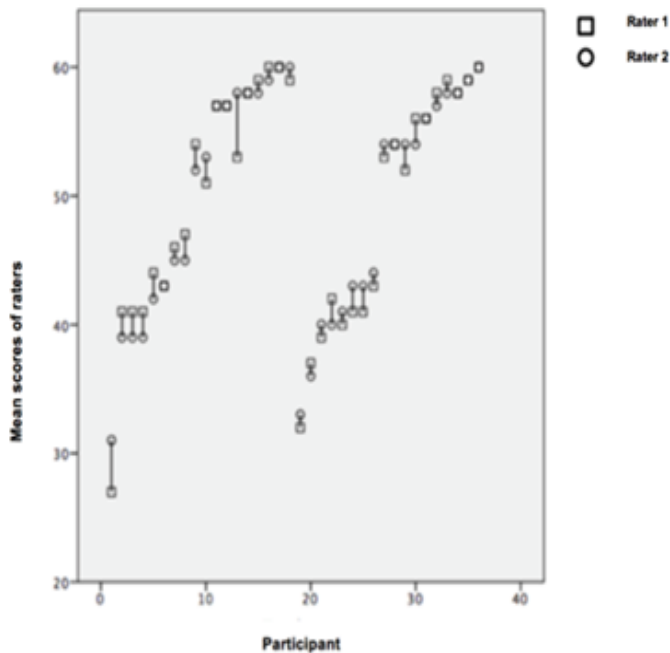
Variables	Results
Gender (male) (%)	17/36 (47, 2%)
Age (year, mean $\pm$ SD, range)	55,5 $\pm$ 11,9 (28-73)
Previous history of physiotherapy treatments	
(Treated previously) (%)	12/36 (33, 3%)
Physiotherapeutic diagnosis (%)	
- Musculoskeletal injuries	18/36 (50, 0%)
- Chronic diseases	18/36 (50, 0%)
COPD	9/18 (50, 0%)
MS	5/18 (27, 8%)
Dystrophy	1/18 (5, 6%)
Parkinson	1/18 (5, 6%)
Partial paraplegia	2/18 (11, 1%)

**Table 2:** Demographic characteristics of the raters.

Variables	Results
Gender (male) (n)	6-May
Completed Master's degree, (yes) (n)	6-Apr
Years of professional experience (year, mean $\pm$ SD, range)	14,7 $\pm$ 11,3 (1-28)

**Table 3:** Mean scores of raters.

Participant	Mean rater 1	Mean rater 2
1	31	27
2	39	41
3	39	41
4	39	41
5	42	44
6	43	43
7	45	46
8	45	47
9	52	54
10	53	51
11	57	57
12	57	57
13	58	53
14	58	58
15	58	59
16	59	60
17	60	60
18	60	59
19	33	32
20	36	37
21	40	39
22	40	42
23	41	40
24	43	41
25	43	41
26	44	43
27	54	53
28	54	54
29	54	52
30	54	56
31	56	56
32	57	58
33	58	59
34	58	58
35	59	59
36	60	60



**Figure 1:** Mean scores per participant according to the two raters.

**Table 4:** Inter-rater reliability differentiated by diagnoses and for all participants.

	ICC (2.1)	95% CI
<b>RAAdMAT<sub>total</sub></b>	0.98	0.97-0.99
<b>RAAdMAT<sub>musculoskeletal</sub></b>	0.98	0.94-0.99
<b>RAAdMAT<sub>other</sub></b>	0.99	0.98-0.99

ICC = Intraclass correlation coefficient, CI = Confidence Interval

## Discussion

The aim of this study was to measure the inter-rater reliability of the Dutch version of the RAAdMAT (RAAdMAT-NL) in patients (with musculoskeletal injuries and with chronic diseases) who are undertaking physiotherapeutic rehabilitation in a primary physiotherapeutic practice. The results show that the inter-rater reliability of the RAAdMAT-NL is excellent; ICC = 0.98 for all participants. The inter-rater reliability is also excellent in patients with mus-

culoskeletal injuries (the original population) (ICC = 0.98) and patients with chronic diseases, like MS, COPD, dystrophy, Parkinson's disease and partial paraplegia (ICC = 0.99). This is important for both clinical practice and further research, because a strong inter-rater reliability is necessary for interpreting change in the individual patient [19].

The results of this study are in accordance with the results of previous research [12, 13], which showed that the original version of the RAAdMAT can reliably measure adherence in the physiotherapy practice in patients with musculoskeletal injuries and has an excellent inter-rater reliability (range ICC = 0.96-0.99). This study shows that the RAAdMAT-NL also has an excellent inter-rater reliability. But this study also adds to previous research by showing that the RAAdMAT-NL is also applicable in patients with chronic diseases. As such, the RAAdMAT-NL meets almost all requirements of an appropriate measurement: it is reliable, interpretable at an individual level, easy and simple to use, and low cost [14]. Because the measurement is in Dutch, it is easy for Dutch people to complete and to analyze.

The use of a diverse population was strength of this study, but the study has also weaknesses. First, the results of this study were obtained in one physiotherapy practice where the raters knew most of the participants. Although participants were blinded for the assessment, one of the raters might have recently worked with one or more of the participants. This would give the rater more information about the participant than the other rater, which would lead to information bias. If information bias occurred, then the inter-rater reliability could be underestimated. However the inter-rater reliability was excellent, so probably information-bias did not occur. Second, raters had to assess participants independently, but whether this happened at all times could not be ensured. If mutual consultation occurred, then the inter-rater reliability could be overestimated.

Nevertheless, the results are promising as the first step of the development of a Dutch instrument for measuring adherence in the physiotherapy practice. When an unexpected poor outcome is seen in patients, it is recommended to complete the RAAdMAT-NL for this patient. That way, the

physiotherapist can assess whether there is non-adherence in the patient and thus whether the intervention should be changed. Also, the physiotherapist can engage in dialogue with the patient about the non-adherence. Ultimately this may lead to better treatment outcomes [7, 10, 13].

To provide tailored interventions for each patient, reliable measurements are needed. Using reliable measurements has added value for patients, physiotherapists and society. Using reliable measurements can increase adherence in patients and adherence can in turn be a tool to achieve health gains in patients [7]. Better treatment results contribute to better quality of life and lower healthcare costs for patients and society [3, 7].

To achieve this, more research to the RAdMAT-NL is needed. Future studies should increase the reliability by using more raters from multiple primary physiotherapy practices. This will provide a more definitive conclusion regarding the inter-rater reliability of the RAdMAT-NL for patients with musculoskeletal injuries and with chronic diseases.

Also, future research should perform a factor analysis to demonstrate the multidimensional character, the three subscales, of the RAdMAT-NL (attendance/participation, communication, and attitude/effort) [13]. Demonstrating these subscales would show the multidimensional character of the RAdMAT-NL and that it can be used to increase adherence through interventions for specific attitudes and behaviors.

### Conclusion

In conclusion, the inter-rater reliability of the RAdMAT-NL is excellent in patients who are undertaking physiotherapeutic rehabilitation in a primary physiotherapy practice.

**Ethical approval:** This study is beyond the scope of the Medical Research with People Act, because this is a one-time completion of a questionnaire, without major, stressful or intimate questions.

**Conflict of interest:** None Declared.

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